* NOTICES *



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## DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the transit guide apparatus of an elevator, and relates to the guide apparatus of the elevator for reducing riding cage horizontal vibration especially.
[0002]
[Description of the Prior Art] There is a technique indicated by JP,5-186162,A as a Prior art about the guide apparatus of an elevator.
[0003] The contact mold guide apparatus to which a guide rail is always contacted, a guide apparatus is ridden on it, and it shows a cage, and the non-contact mold guide apparatus to which it rides on a guide rail face to face by non-contact, and it shows a cage constitute from this conventional technique, and the magnetic guide which is a non-contact mold guide apparatus detects the gap (gap) change between the electromagnet which countered the guide rail with this control unit, and a guide rail with a displacement pickup, and is controlling to make a gap regularity.
[0004] The approach of, changing with an actuator the location of the dead weight attached in the bottom of a cage based on a cage acceleration signal on the other hand, and carrying out inhibitory control of the cage vibration is also proposed.
[0005]
[Problem(s) to be Solved by the Invention] However, it was impossible to have detected the abnormalities of an actuator which drive a magnetic guide and a dead weight. Because, [ whether since it is the system by which controlling force always operates for control of the unbalanced load in disturbance, such as the PAX's unbalanced load, getting on and off of the PAX, and a rail knee, and a tail code the system is working normally, and ] or -- irrespective of the condition that it is not necessary to operate -- for example, the output of an acceleration sensor or a gap sensor -- abnormal -- it is -- an open circuit of a power converter and an actuator -- simplistic -- whether is the system therefore produced unusual, and does controlling force continue, and it is working Or there was a problem which decision of having been interrupted does not attach.
[0006] The purpose of this invention is to offer the fault detection equipment of the actuator used for the guide apparatus of an elevator riding cage.
[0007]
[Means for Solving the Problem] The fault-detection equipment of the actuator of this invention controls an actuator by acceleration feedback or gap feedback, and detects the current which flows to an actuator, and when a riding cage is in the non-oscillation mode and a detection information value exceeds the set point set up beforehand, or when a cage does not exceed the set point which the detection information value set up beforehand in the situation which the oscillation mode, i.e., an elevator, is running, an actuator judges it to be failure.
[0008]
[Function] When this invention rides in the non-oscillation mode, and a cage is a idle state and there is no getting on and off of the PAX, A current's not flowing to an actuator, while the actuator's is operating

normally, and a dead weight are located at a neutral point, moreover Since an actuator is guided in the oscillation mode (under elevator transit), generating the force which supports the unbalanced load of a riding cage, and the force according to oscillating information While the actuator is operating normally, it operates so that the control result at the time of each mode may be supervised and the existence of failure of an actuator may be judged paying attention to there being neither a transitional current's flowing to an actuator nor a dead weight in a long duration neutral point stay.

[0009]

[Example] Drawing 1 is the front view of the transit guide apparatus of an elevator riding cage, and it is the circuit diagram of the fault detection equipment of the actuator control device with which drawing where drawing 2 looked at the block diagram of actuator control, and drawing 3 looked at the riding cage of drawing 1 from the top and drawing showing the internal circuitry of the control device of an actuator, and drawing 4 constituted the fault detection timing chart, and drawing 5 constituted this invention.

[0010] For 1, in drawing 1 , a riding cage and 2 are [ a rubber vibration insulator, the actuator with which an acceleration detector, and 71-74 were constituted from a roller guide, and 41 and 42 constituted 81-84 from an electromagnet a guide apparatus and 61a-61d as for a guide rail, and 51-54, and 90a-90d of a cage frame, and 31 and 32 ] the control units of actuators 81-84.

[0011] By drawing 1 which shows the guide apparatus of an elevator, the riding cage 1 is supported by rubber vibration insulators 31 and 32 on the cage frame 2. The guide apparatus 51-54 to which it rides on along with the guide rails 41 and 42 set up in the hoistway, and shows a cage are attached in this cage frame 2.

[0012] Guide apparatus 51-54 are equipped with the roller guides 71-74 which are the first guide apparatus which always contacts guide rails 41 and 42 and carries out transit guidance, and the actuators 81-84 constituted from an electromagnet which is the second guide apparatus which carries out transit guidance by non-contact in guide rails 41 and 42 by drawing 1 , respectively. Furthermore, the control units 90a-90d and the acceleration detectors 61a, 61b, 62a, and 62b of actuators 81-84 which are the second guide apparatus are installed near each actuator 81-84. Each control units 90a-90d of the actuators 81-84 which are the second guide apparatus Gap control is made into the Maine feedback loop as the block diagram is shown in drawing 2 according to the output of the gap sensor which detects the distance between the acceleration detectors 61a, 61b, 62a, and 62b attached near the actuator of the cage frame 2, and the rail and guide apparatus which are not illustrated. An actuator is controlled by the device in which minor feedback control is performed about acceleration control and current control.

[0013] For example, the magnitude of horizontal acceleration is detected by acceleration detector 61a attached in the cage frame upper part, it rides by controlling the current of an actuator 81, i.e., a suction force, by control-device 90a, and vibration of a cage is controlled.

[0014] Similarly, other actuators 82, 83, and 84 attached in the cage frame perform current control with the acceleration detectors 61b, 62a, and 62b and control units 90b, 90c, and 90d of each near.

[0015] Drawing 3 shows the configuration of the guide apparatus which looked at the riding cage of drawing 1 from the top.

[0016] The actuators and 90a which the acceleration detector for longitudinal directions, and 63a and 63b constituted 61a and 61b from drawing 3 , and constituted the acceleration detector for cross directions, and 81, 82, 85-88 from an electromagnet are the control unit of actuators 81, 85, and 86, and a current to which in an integrator and 93 current amplifier and 94 flow to a phase inverter, and 95 flows [ 91 / amplifier and 92 ] on an electromagnet, and 96 is a current detector.

[0017] In addition, in order to simplify explanation here, the example which controls an actuator only by acceleration feedback is shown.

[0018] By drawing 3 , control unit 90a of actuators 81, 85, and 86 is the output of acceleration detector 61a attached in the cage frame 2, detects the acceleration of the direction (longitudinal direction) which the slideway of the guide rail of the cage frame 2 counters and suits, and performs feedback control of an actuator 81. That is, the proportional integral of the output of acceleration detector 61a attached in the cage frame upper part is carried out in the circuit which consists of the integrator 92 which prefaced the

band pass filter from which the noise superimposed on the amplifier 91 and acceleration signal of control-device 90a is removed, and it controls the current 95 of the electromagnet of an actuator 81 by the current amplifier 93. Feedback control of the current of an electromagnet is carried out with the current detector 96 for response[ high-speed ]-izing of a current.

[0019] Furthermore, all configurations are installing the actuators 85 and 86 constituted from an electromagnet which carries out transit guidance by the roller guide (illustration has not been carried out) which cross-direction guidance always contacts and carries out transit guidance, and non-contact to a guide rail 41, respectively. Actuators 85 and 86 are considered as the configuration of a pair, the acceleration of the cross direction of a cage is detected by acceleration detector 63a, and current control of actuators 85 and 86 is carried out for this output as an input of control-device 90a.

[0020] As for the electromagnet of an actuator, two pieces and the object for longitudinal directions consist of one piece and a total of three pieces for the object for cross directions as 1 set. Since an actuator is in four places of a riding cage, it will ride by total of 12 electromagnets, and a cage will be supported. It has the acceleration detector per piece each 1 set of control unit, the object for cross directions, and for longitudinal directions to 1 set of actuator.

[0021] By the way, in order to realize an elevator comfortable to ride in, it is required for the actuator to operate normally. For that purpose, it is necessary to detect failure of an actuator control unit.

[0022] That is, by the non-oscillation mode, i.e., the condition that getting on and off of the PAX is not performed for the elevator by the quiescent state, as shown in the timing chart of drawing 4 (a), since there is no disturbance, if actuator control-device 90a is normal, a current will not flow to an actuator. Moreover, while the oscillation mode, i.e., an elevator, runs, the horizontal vibration acceleration by disturbance, such as a knee of a guide rail, an unbalanced load by tail code heart gap, and the PAX's unbalanced load, arises. Therefore, if a control device is normal, as shown in drawing 4 (c), a transitional current will flow on the electromagnet of an actuator.

[0023] In this invention, in order to detect failure of an actuator control device, as shown in the circuit diagram of drawing 5 , a comparator 97 compares the output and the set point of amplifier 91 of the current detector 96 which detect the value proportional to the current 95 which flows from the current amplifier 93 to an actuator 81, and the judgment machine 98 can detect failure of an actuator control device the output of a comparator 97, and by considering an elevator operation mode signal as the input of the failure judging machine 98. When operation mode is the non-oscillation mode, for example, case [ whose output of a comparator is / like drawing 4 (b) ] Since many currents will flow on the electromagnet rather than the compound value set up although there was a cage when it had no passenger at a quiescent state By the output of a comparator 97 serving as "H", further, since the signal from operation mode and the signal from here [ since it is without a passenger at the halt time ] are "H", the failure judging machine 98 generates output"H", and actuator control unit 90a judges with it being unusual, and outputs a failure signal. moreover, the oscillation mode -- since it will be, only a current unusually lower than the compound value with which the elevator was set as level comparatively low in spite of under transit case [ whose output of a comparator was / like this drawing (d) ] will be in the condition are not flowing on an electromagnet, a comparator 97 will output "H" too and the function as an actuator has not achieved, a control unit judges a failure judging machine 98 to be abnormalities, and it outputs an abnormality signal. In addition, since it can detect when it changes to the non-oscillation mode, since it surely changes from the oscillation mode to the non-oscillation mode once [ at least ] or more into 1 transit stroke even when a control unit becomes unusual during elevator transit in this drawing (d) and the current beyond the set point flows continuously, the abnormalities of a control unit are detectable in a short time.

[0024] In addition, although the example described the fault detection equipment for the control unit of the actuator which consisted of electromagnets as an elevator guide apparatus the system failure detection by solenoid current detection of the actuator control unit which controls the forcing force which it is constituted, other guide apparatus, for example, solenoid, and is forced on a guide rail through a roller or a shoe -- or If the dead weight attached in the bottom of a cage is moved with an actuator, a system which controls cage vibration also detects an actuator current and a dead weight

location and the value is judged according to elevator operational status, it cannot be overemphasized that it is applicable also to system malfunction detection.

[0025]

[Effect of the Invention] Since failure of an actuator control unit is detectable according to this invention, stability can be provided with an elevator system comfortable to ride in in support of a riding cage.

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Drawing selection Representative drawing

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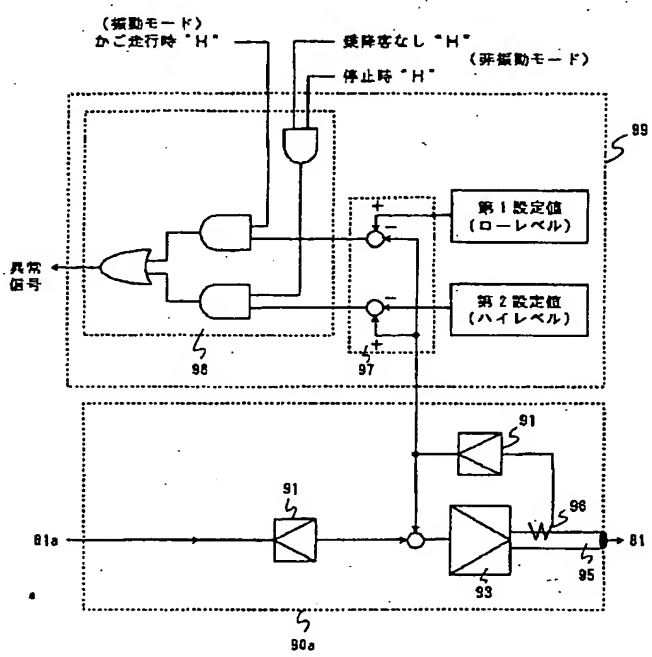


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